

character, except that which is incident to the junction of the many spines which make up the spiculum. Average extent of stellate spicula measured from the ends of opposite rays .001. Rays sometimes of uniform thickness, occasionally enlarged at the ends with microspines, curved inward.

There are also many small spicula with one or two long arms, forming an axis from which proceed other rays or arms perpendicular to the axial rays. These are all microspined, sometimes with blunt terminus and sometimes tapering slightly.

The two kinds of birotulate spicula found in the statoblast of this sponge, as already described, bring it into the genus *Heteromeyenia*, Potts. But for this feature it must be classed at least as a remarkable form of *Meyenia plumosa*, Carter. Forty years ago Mr. Carter, of England, found his specimen of the last-named sponge in the water-tanks of Bombay, India. This he described in 1849. No other specimen or variety of it was found again till three or four years ago, when Dr. Palmer found a variety of it on the banks of the Colorado River. This was described by Mr. Potts, who named it *Meyenia plumosa*, variety *Palmeri*. See his description in his monograph of the freshwater sponges.

As the term used to designate the generic character of this entirely new form is technically expressive of one of its peculiarities, I have thought it best to use a specific term which is also expressive of the stelliform spicula, which, among all the freshwater sponges, so far as I know, are only found in this and the two allies above named. It will therefore be known as *Heteromeyenia radiospiculata*.

This sponge was found in the Ohio River, twelve miles from Cincinnati, by my friend Mr. George B. Twitchell, in September 1887, and sent to me in November, same year. I acknowledge my indebtedness to Mr. Twitchell for several other specimens found also in the Ohio River. Among them are *Carterius tubisperma*, Mills, a fine specimen of *Tubella pennsylvania*, Potts, and *Spongilla lucustris*, Auct.—*The Microscope*, no. 2, February 1888, p. 52 (Detroit).

On Parasitic Castration in the Eucyphotes of the Genera Palæmon and Hippolyte. By M. A. GIARD.

In 1837 Rathke noticed the curious fact that the Palæmons infested by *Bopyri* belonged exclusively to the female sex:—“*Mirabile dictu Bopyri omnia que vidi exempla—vidi autem eorum plures centurias—solummodo in Palæmonibus feminis repereram, licet in manus meas non pauciores horum animalium mares quam femine incidissent*”*. All subsequent authors down to the most recent one, P. Fraise, have only confirmed Rathke’s observation.

Guided by my previous discoveries as to the effects of parasitic castration in Decapod Crustacea infested by Rhizocephala, I last

* ‘*De Bopyro et Nereide*,’ p. 18.

year put forward the hypothesis that the fact noticed by Rathke was no doubt correct only *in appearance*, and that if no male Palæmons are found to harbour *Bopyri* this is because the atrophy of the testes in the infested males produces as a consequence an arrest of development of the external sexual characters *. I have since been able to verify the correctness of this supposition both in our European prawns infested by *Bopyri* and in *Palæmon ornatus* of the Brussels Museum infested by *Probopyrus ascendens*. The large size of the last species renders the proof more easy. Besides the position of the genital apertures there are, in the Palæmons, a certain number of secondary sexual characters which have been well indicated by Grobben and J. V. Boas, namely:—

1. The males are smaller than the females.
2. The thoracic chelæ are generally longer in the males.
3. The inner ramus of the first pair of abdominal feet is much more developed in the male than in the female and differently fringed.
4. The second abdominal foot bears on the inside of the inner ramus, between this and the retinaculum (*appendix interna*, Boas), a styloid copulatory appendage furnished with stiff setæ (*appendix masculina*, Boas).
5. The branch of the first antenna which bears the olfactory setæ is larger in the male than in the female, and this absolutely and not only relatively to the size of the body; the olfactory setæ are also more numerous.

We may add to the preceding characters a peculiarity indicated by E. von Martens, and which is of very great practical value, namely that in the females the free space between the bases of the 4th thoracic feet is much larger than in the males.

The characters derived from the size and from the form of the chelæ are of relative value. If we compare suitably selected series of individuals it is easy to find males of smaller size and with shorter chelæ than certain females. It is therefore not surprising to find that these characters disappear completely in the castrated males. But with the exception of the distinctions derived from the position of the genital apertures and the distance of the feet of the fifth thoracic pair it is easy to ascertain that the other sexual characters also become attenuated, or even disappear, in the infested males. The inner ramus of the first abdominal foot is, perhaps, a little larger than in the female, but at any rate much smaller than in the normal male. On the second pair the *appendix masculina* is generally wanting. In one word, the general aspect is so profoundly modified that, without careful examination, the infested male would certainly be determined as a female. Even the amount of separation of the coxæ of the fifth pair of thoracic feet and the

* Bull. Soc. Sci. de la France et de la Belgique, 1887, p. 12 *et seqq.*; translated in 'Annals,' ser. 5, vol. xix. pp. 325-345.

form of the sternal portion of the corresponding segment approach the arrangements existing in the other sex.

However, it must be remarked that in the case of the Palæmons, as in the other previously studied cases of parasitic castration, there is a very singular want of uniformity in the phenomena observed. Thus a specimen of the male *Palæmon serratus* of the shores of the Channel, infested by *Bopyrus squillarum*, has very distinctly retained the attributes of its sex, and even presents only a slight reduction of the *appendix masculina*. Perhaps this diversity in the extent of the modifications observed is to be ascribed to the more or less early period of infestation. Moreover, these modifications are not indelible, so far as I may judge from experiments made at the Laboratory at Wimereux upon male *Paguri* castrated by *Phryxus paguri*; when subsequently freed from their parasites the characters of the male sex gradually reappeared at the successive moults.

The numerous species of *Hippolyte* which abound in the arctic seas are often infested by Bopyrians confounded by authors under the collective names of *Gyge hippolytes*, Kröyer, and *Phryxus abdominalis*, Kröyer. Hitherto I have not been able to study a sufficient number of these parasites; but a careful examination of the synonymy leads me to think that they exert the same action upon the *Hippolyte* as the *Bopyri* upon the *Palæmon*. In fact, among the numerous species of *Hippolyte* established by Kröyer and the zoologists of the early part of the present century, some have since been recognized as being only the two sexes of the same specific type. Kingsley, G. O. Sars, &c. have shown that *Hippolyte borealis*, Kr., is the male of *H. polaris*, Sab., and that *H. Phippsii*, Kr., is the male of *H. turgida*, Kr. Now if we run over the lists of the habitat of *Phryxus abdominalis* and *Gyge hippolytes*, we find with surprise that these parasites have constantly been indicated upon *Hippolyte polaris* and *H. turgida*, never on the male forms *H. borealis* and *H. Phippsii*. In a recent and very careful work upon the Crustacea of the west coast of Greenland, H. J. Hansen, after having indicated the presence of *Phryxus abdominalis* upon *Pandalus Montagu* and four different species of *Hippolyte*, adds that of the comparatively large number of individuals of this Bopyrian observed by him not one was attached to a male host. Lastly, there is a curious fact to be noted. Kröyer, whose works are generally so precise and exact, says, in his monograph of the genus *Hippolyte*, that the female genital aperture is situated in these Carides at the same point as that of the males, that is to say, at the base of the coxæ of the posterior feet. Is it not probable that Kröyer made this erroneous observation upon infested males which he took for females? This is a point to which I would call the attention of the Scandinavian zoologists. There are interesting investigations to be pursued upon a series of phenomena which are still very little known.—*Comptes Rendus*, February 13, 1888, p. 502.